

# Eagles Saved

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Electrocution

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By Allan R. Ansell

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Simple survival isn't all that simple anymore for birds of prey which claim as home the skies over the Nation's rangelands.

Raptors have been starved out as agriculture converted ranges to farms, wiping out the habitat of the jackrabbits, ground squirrels, mice and reptiles on which the birds feed.

And in the past, under the guise of predator control, thousands of eagles and hawks in Western States were shot from aircraft.

But all this has not gone without notice, and someone is doing something about it.

The eagle slaughter of the 1960's resulted in a public mandate for legal protection of both the bald and golden eagle. National concern spurred the passage of Federal protection for both species.

At the same time, public concern prompted field work to identify other human-related causes of raptor mortality. One cause pinpointed was accidental electrocution by electrical distribution lines which crisscross the range.

Release of this information, and the accompanying public concern about the eagles, gave rise to an investigation of the electrocution problem by a western electrical utility and a raptor expert. This research led to an extensive program to eradicate the offending features of distribution lines and a highly successful raptor conservation program.

*Allan R. Ansell is Environmental Studies Coordinator, Idaho Power Company, Boise.*

**Wildlife Film Man**

The association between conservationist and utilities began in March 1972, when the Idaho Power Company, headquartered in Boise, asked birds-of-prey authority Morlan W. Nelson to assist with an investigation of the electrocution problem.

Nelson, also of Boise, has spent most of his life studying and working with raptors. He has been a consultant and photographer on Walt Disney wildlife films and has traveled internationally as a falconry consultant. Nelson was a natural for the job.

Intent of the studies was to identify causes of electrocution and develop corrective measures.

Falconers and others knowledgeable about eagles know the birds are extremely selective in their choice of landing sites. And, in order to identify preferred landing sites, one must have an intimate knowledge of eagles' behavior, of prevailing winds, and topography.

**Poles as Perches**

In areas of the West barren of cliffs or trees, raptors favor specific power poles as hunting and feeding perches. They usually prefer poles having crossarms crossways with the prevailing wind and in a commanding topographic position. By examining poles fitting this description, it is possible to pinpoint those preferred by eagles.

Eagles' selectivity was pointed up when it was discovered a single pole might have several dead birds, either shot or electro-

cuted, beneath it. Often other poles along the same line did not indicate eagle activity.

Obviously, this selectivity simplifies corrective efforts by reducing the number of poles requiring modifications.

Initial field investigations by Nelson and Idaho Power personnel revealed most eagle electrocutions occurred on relatively small lines of between 20,000 and 69,000 kilovolts. Two types of poles were found to be involved.

Many electrocutions occurred on single-phase lines with a conductor mounted on top of a pole and a ground wire extending to within a short distance of the conductor.

Single-phase current is carried to homes, businesses, factories and farms by a two-wire circuit. It is a common mode of electrical service delivery to locations not requiring high power.

The second hazardous design was found to be a three-phase, single-pole line with crossarms 6 to 8 feet wide. Conductor spacing was too close to allow a large bird to land safely and without touching wires on either side simultaneously, thus forming an electrical pathway through its wings.

It also was noted poles with additional electrical equipment—such as transformers and jumpers—and corner poles sometimes could present special safety problems to raptors.

### **Trained Eagles Used**

In order to examine exactly how power lines interfered with eagles' activities, a mockup of the offending power poles and lines was built. Nelson's trained golden eagles would fly to these mockups, their flights documented on 16mm film.

Studies of slow-motion photography taken during these test flights demonstrated electrocution could occur if an eagle with a 6- to 8-foot wingspan made contact simultaneously with two phase conductors or a single phase conductor and a ground wire.

A practical solution appeared to be placing conductors and ground wires at sufficient distance from each other to prevent simultaneous contact. This suggestion was made to utility engineers, who redesigned poles accordingly.

### **'Streamlined' Design**

A mockup of the new design was built and tested, again using trained eagles. The new design featured conductors and ground wires supported by short side-arms projecting from the poles rather than by crossarms.

This configuration, known as the "armless" or "streamlined" design, now is used by many companies as a standard for construction in areas inhabited by raptors.

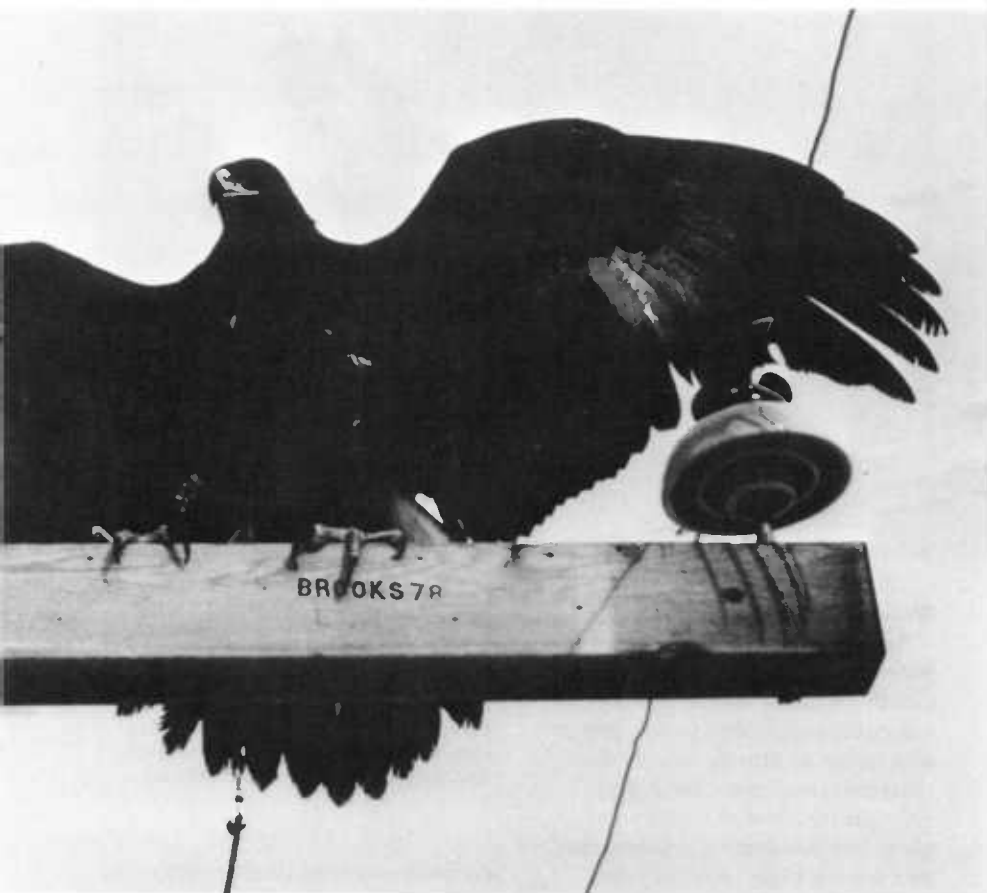
Having developed a fairly accurate idea of the how and why of eagles' problems with power



lines, utility personnel and Nelson proceeded with studies of existing lines to determine corrective steps to prevent electrocution.

Using similar study techniques, they came up with several methods of modifying existing poles that appeared to be hazardous.

Together they decided poles with crossarms could be rendered safe by lowering the arms holding the two outside conduc-



Morlan W. Nelson

tors and installing the center conductor on a pole-top pin. This would increase the distance between conductors.

To gain a safety margin, a distribution arm must be lowered enough to provide about 60 inches of separation.

Another method of obtaining the required separation is to install a pole-top extension supporting the center phase. This extension must be a minimum of 60 inches above the crossarm.

*This eagle is courting death. If it happens to touch the wires on each side it could be electrocuted. Idaho Power Company engineers worked out modifications to prevent injury and death to these birds.*



Morian W. Neilson

### Wooden Perch Installation

An alternative to modifying the pole is to install a wooden perch a safe distance above the electrical equipment. The perch, generally made of sturdy two-by-four construction, must be high enough to allow the birds to clear the dangerous equipment, but not so high that they can continue to land in the danger zone. A maximum distance of two feet generally is recommended.

Installing insulation over conductors is another reliable and inexpensive way of making hazardous lines safe. Conductors may be covered with material such as pvc pipe extending about 6 feet on either side of the pole. Jumper cables also should be covered when this method is used.

Although several methods of pole modification are available to

*Sturdy perches built above the power lines give eagles a safe landing site from which they can hunt and feed. It was*

*found that eagles are selective in their choice of landing sites and not all utility poles have to be modified.*

correct problem lines, utility engineers need leeway in selecting methods. This allows the utility to design the most reliable, economical line to serve customers and still protect raptors.

Following are some suggested priorities in selecting the type of modification to be used:

- 1) When new line construction is being considered, the preferred technique for reducing the likelihood of raptor electrocution is streamlined or "armless" pole configuration. Although this technique may require more poles per mile of line than stand-

ard crossarm construction, actual cost of the new line may be lower because of the availability and market conditions of construction materials.

2) On existing crossarm structures, raising the center phase may prove to be the most effective method of modification and serves to properly isolate electrical parts

3) Gapping ground wires, when consistent with design needs of the utility, has proven to be an inexpensive and effective way of modifying poles. It is recommended highly in appropriate situations

4) The addition of insulation to conductors is effective, but it has the disadvantage of needing periodic inspection and maintenance. This is because insulating materials may decompose over time

5) Use of pole-top perches is beneficial in some instances. Spacing of the perch above the conductor is extremely important in this technique. Perches are particularly useful when a large amount of hardware is located at or near the top of the pole or when transformer banks, switches and other equipment are so situated.

Ironically, Nelson's research also served to exonerate utilities of raptor deaths in some cases.

There has been a long-standing tendency to assume a bird found dead beneath a power pole died of electrocution. However, close examination of the carcass is required to positively identify the cause of death—not always

electrocution, but sometimes gunshot wounds, diseases, malnutrition or poisoning.

In electrocution cases, birds often will exhibit severe burns and evidence of trauma. The feet, beak or wings are most likely to show burns; however, this is not always the case. Lethal electrical currents can pass through an animal without leaving visible signs.

### **Careful Check Needed**

Careful examination of a bird—including skinning or X-raying the carcass—is essential to avoid erroneous diagnosis of cause of death. Many birds reported killed by electricity later were found to have died from other causes.

A case in point occurred in the Camas Prairie region of Idaho. A conscientious person reported to the local electrical utility that he had found 18 supposedly electrocuted birds under various distribution lines located in the vicinity.

Utility personnel inspected the lines, and most turned out to be telephone circuits, which do not carry sufficient electrical charge to cause electrocution. Other lines carried electricity, but had phase spacing too wide to allow electrocution.

In this case, pesticides and shooting became the prime suspects. Only one of 18 reported fatalities turned out to be electrocution. Corrective action was taken on the suspect poles and no further incidents were reported.

**'Double Whammy'**

In other cases, birds having physical marks indicating electrocution also had other injuries likely to have been the actual cause of death.

One such incident involved a bald eagle. A sportsman was watching the bird, perched on a distribution line, when another person, some distance away, fired a rifle. The bullet struck the eagle. As the bird fell to the ground, it spread its wings and came into contact with phases on the power lines. It naturally received a jolt of electricity, burning several wing feathers.

The offending hunter escaped without punishment. However, the witness found, upon inspection, that the bird was alive and took it to Nelson. The bird succumbed after three days to the double whammy of the shooting and electrical shock.

While the Idaho research was being conducted, the Edison Electric Institute—through the efforts of Richard Thorsell, environmental program manager—coordinated a workshop to study problems of raptor electrocution on power lines. Participants included western utilities, various state and Federal agencies, and other interested groups.

As other utilities became aware of the research being carried on in Idaho, they began cooperative work on specific problems within their own organizations. Most notable is work done by the Utah Power and Light Company, Salt Lake

City, and the Pacific Power and Light Company, Portland, Oreg. Cooperative studies among these utilities and Idaho Power continued through 1982.

**Films Tell the Story**

Several films have told the story of utility efforts to save raptors from electrocution. The first, *Powerlines, A Place in Nature*, was produced in 1974 by Idaho Power Company.

A second motion picture, *Silver Wires, Golden Wings*, was produced in a joint effort of several utilities and the Edison Electric Institute. It was circulated widely and received awards from cinematic associations and wildlife groups.

Among other efforts to disseminate the newly found knowledge, education programs have been incorporated in several land management training programs and in schools across the Nation.

It's worth noting the study of electrocution problems has led to other unexpected benefits for birds of prey. For example, nesting platforms were designed and installed on transmission towers, giving eagles safer, more permanent places to raise their young. And changes were made in utilities' treatment of eagles' nests.

**Sticky Problem**

Eagles often use very long sticks, up to 6 or 7 feet long, in nest building. If the sticks dangle down too far from the nest, they can make contact with an

electrical conductor, allowing current to flow back to the tower. This can cause a line outage or, occasionally, a nest to catch fire.

Utility linemen customarily destroyed nests they found, only to learn later they were compounding the problem. Eagles are persistent when it comes to nest building, and will attempt to replace a destroyed nest.

Instead of dismantling nests, linemen now trim longer sticks hanging from them. With the nest left intact, each year the eagles add sticks to the top. If undisturbed, birds will use the same site year after year.

### **Advantages of Platforms**

Nesting platforms have a number of advantages over wild nests. Chances are good that if they are placed on certain towers, the birds will use them over other areas on the tower. This allows the utility to control nest placement, and thus limits the likelihood that nest building will interfere with line operation.

Platforms also offer advantages for the birds. When properly constructed and placed, they provide protection from wind and sun to the young birds, increasing their chances of survival.

By providing a missing element—nesting sites—to otherwise suitable habitat, transmission structures may provide a much more positive impact on some wildlife species than ever imagined.

Wise use of nesting platforms as a management tool may result in benefits to species believed to be threatened or endangered. Bald eagles, ferruginous hawks and peregrine falcons are a few of the species that may reap this benefit.

The first test of nesting platforms was conducted in the fall of 1975 by Idaho Power, which erected six experimental platforms. By the following spring, five of them were being used and produced young birds. The future looks bright for use of this knowledge.

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### **Further Reading**

*Prevention of Golden Eagle Electrocution* is available through the Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, Calif. 94304. EA 2680, \$11.50 per copy.

*Protection of Bald and Golden Eagles From Power Lines*, Bulletin 61-10, Rural Electrification Administration, Washington, D.C. 20505. Free.

*Suggested Practices for Raptor Protection on Power Lines—The State of the Art in 1981* is available at the Raptor Research Foundation, Dr. Gary Duke, Department of Veterinary Medicine, University of Minnesota, St. Paul, Minn. 55108. \$6.50 per copy.